

THAT WHICH IS CLAIMED IS:

1. A method of cleaning a microelectronic substrate, comprising:
providing a cleaning fluid, said cleaning fluid comprising an adduct of hydrogen fluoride with a Lewis base in a carbon dioxide solvent; and then
cleaning said substrate by contacting said substrate to said cleaning fluid for a time sufficient to clean said substrate.
2. The method according to claim 1, wherein said Lewis base has a pKa of at least 5.
3. The method according to claim 1, wherein said Lewis base is an amine.
4. The method according to claim 1, wherein said Lewis base is pyridine or poly(vinylpyridine) or triethylamine .
5. The method according to claim 1, wherein said cleaning fluid comprises:
from 0.001 to 20 percent by weight of said adduct of hydrogen fluoride and a Lewis base; and
from 50 to 99.999 percent by weight of carbon dioxide.
6. The method according to claim 1, wherein said cleaning fluid is nonaqueous.
7. The method according to claim 1, wherein said carbon dioxide is liquid carbon dioxide.
8. The method according to claim 1, wherein said carbon dioxide is supercritical carbon dioxide.

9. The method according to claim 1, wherein said cleaning step is followed or preceded by the step of cleaning said substrate with a rinse fluid, said rinse fluid comprising carbon dioxide.

10. The method according to claim 9, said rinse fluid further comprising a cosolvent.

11. The method according to claim 1, wherein said substrate has a photoresist layer formed thereon, and said cleaning step removes photoresist from said substrate.

12. The method according to claim 1, wherein said substrate has etch residue deposited thereon, and said cleaning step removes etch residue from said substrate.

13. The method according to claim 1, wherein said substrate has ash residue deposited thereon, and said cleaning step removes ash residue from said substrate.

14. The method according to claim 1, wherein said substrate has metal residue deposited thereon, and said cleaning step removes metal residue from said substrate.

15. The method according to claim 1, wherein said substrate comprises a low k dielectric material having an oxide layer, photoresist, or etch residue formed thereon, and said cleaning step removes the oxide, photoresist or etch residue from said low k dielectric material.

16. The method according to claim 1, wherein said substrate is a microelectromechanical device, and said cleaning step removes processing residues and/or environmental contaminants from the substrate.

17. The method according to claim 1, wherein said adduct is formed *in situ*.

18. The method according to claim 1, wherein said adduct is formed *in situ* by adding anhydrous hydrogen fluoride to a carbon dioxide solvent that contains said Lewis base.

19. The method according to claim 1, wherein said substrate comprises an inorganic oxide containing surface carrying an adhered processing residue, and said adduct chemically etches said inorganic oxide containing surface to facilitate the removal of said adhered processing residue.

20. A fluid composition comprising:

from 0.001 to 20 percent by weight of an adduct of hydrogen fluoride and a Lewis base; and
from 50 to 99.999 percent by weight of carbon dioxide.

21. The composition according to claim 20, wherein said composition is nonaqueous.

22. The composition according to claim 20, wherein said Lewis base has a pKa of at least 5.

23. The composition according to claim 20, wherein said Lewis base is pyridine, poly(vinylpyridine), or triethyl amine.

24. The composition according to claim 20, further comprising from 0.1 percent to 40 percent by weight of a cosolvent.

25. The composition according to claim 20, further comprising from 0.1 percent to 5 percent by weight of a surfactant.

26. The composition according to claim 20, wherein said carbon dioxide is liquid carbon dioxide.

27. The composition according to claim 20, wherein said carbon dioxide is supercritical carbon dioxide.

28. The composition according to claim 20, said fluid having a density of from 0.150 g/cc to 1.1 g/cc and a temperature of from 0 to 80 degrees C.

29. A method of cleaning a microelectronic substrate, comprising:

(a) providing a first cleaning fluid, said first cleaning fluid comprising a single phase solution of an amine and a polar cosolvent in carbon dioxide;

(b) providing a second cleaning fluid, said second cleaning fluid comprising an adduct of hydrogen fluoride with a Lewis base in carbon dioxide;

(c) cleaning said substrate by contacting said substrate to said second cleaning fluid for a time sufficient to clean said substrate; and

(d) cleaning said substrate before, after, or both before and after said cleaning step (c) by contacting said substrate to said first cleaning fluid for a time sufficient to facilitate the cleaning of said substrate.

30. The method according to claim 29, wherein said amine is morpholine, aniline or dibutylamine.

31. The method according to claim 29, wherein said polar cosolvent is a C1-C4 alcohol.

32. The method according to claim 29, wherein said Lewis base is pyridine or poly(vinylpyridine) or triethylamine.

33. The method according to claim 29, wherein said cleaning fluid comprises: from 0.001 to 20 percent by weight of said adduct of hydrogen fluoride with a Lewis base; and

from 50 to 99.999 percent by weight of carbon dioxide.

34. The method according to claim 29, wherein said first cleaning fluid is nonaqueous.

35. The method according to claim 29, wherein said carbon dioxide is liquid carbon dioxide.

36. The method according to claim 29, wherein said carbon dioxide is supercritical carbon dioxide.